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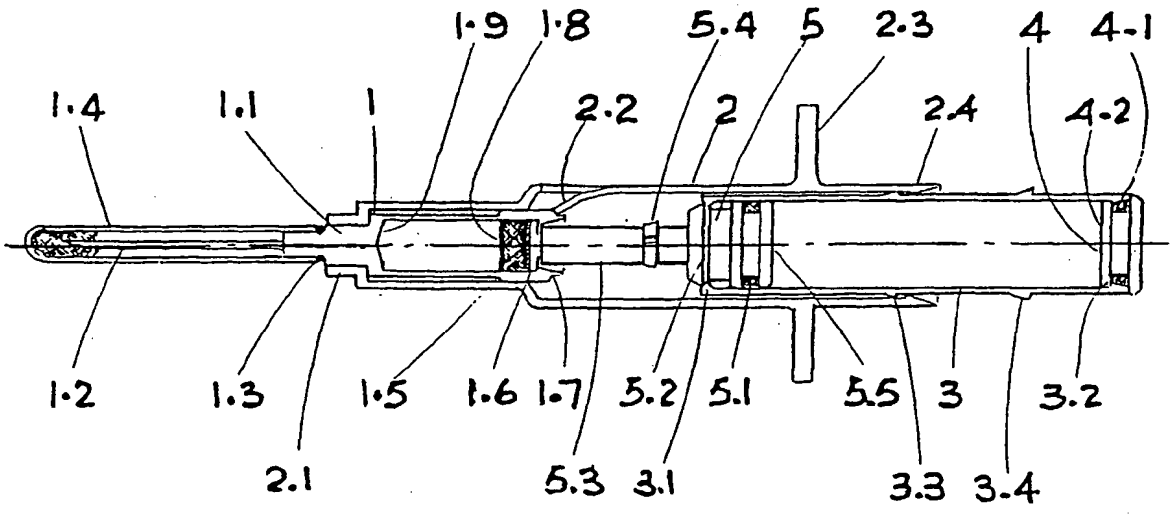
(54) Title: HYPODERMIC SYRINGE



(57) Abstract: A syringe has a capsule assembly (1) which is pre-loaded with injectant fluid (1.10) and is provided with a needle (1.2) that is covered by a sealed needle sheath (1.4). The capsule assembly (1) is placed into a housing (2). The sealed capsule is prepared for use by removal of the sealed needle sheath (1.4). A plunger (4) with an associated piston (5) is used to input the fluid (1.10). The capsule assembly (1) including the needle (1.2) is automatically retracted into the housing (2) after use.

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the injectant fluid into the syringe. Thus, the syringe is charged by the operator immediately prior to use. However, approximately 45% of injections are currently given using a pre-loaded syringe which is typically smaller in capacity than operator loaded syringes. It is expected that the use of pre-loaded syringes will increase significantly with time.

Thus, there is a need to provide a pre-loaded syringe with a retractable needle assembly.

Summary of the invention

In accordance with the invention, there is provided a syringe in which a needle is retracted by stored energy on completion of injection characterised in that the injectant is contained within a sealed needle and capsule assembly that includes a needle sheath wherein for use of the syringe, the seal is broken by removal of the sheath immediately prior to use.

Thus, in accordance with the invention, a syringe is provided which may be pre-charged with injectant, and for which the needle is automatically withdrawn after use to avoid the risk of needle stick injury.

Brief description of the drawings

In order that the invention may be more fully understood an embodiment thereof will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a schematic cross sectional view of an embodiment of syringe in accordance with the invention prior to use;

Figure 2 is a schematic cross section of the syringe shown in Figure 1, after use, with the needle withdrawn into the barrel of the device;

Figure 3 is a schematic cross section of a first alternative embodiment of the invention;

Figure 4 is a schematic cross section of a second alternative embodiment according to the invention;

closure piece 4 has a seal 4.1 which is held in place by a wedge section ring 3.2 of plunger 3.

The piston 5 carries the seal 5.1 which co-acts with the inner surface of the plunger 3 and a triangular section ring 5.2. The piston 5 includes a probe 5.3 which carries a resilient slit ring 5.4. The ring 5.4 is positioned so that it snaps past internal lip 1.6 before the injection stroke is completed.

During assembly, the closure piece 4 and the piston 5 are temporarily held in contact by the use of an appropriate lubricant between the two mating surfaces 4.2 and 5.5. These are inserted as one piece at the right-hand end of the plunger 3 shown in Figure 1. The piston 5 is then drawn through the interior of the plunger 3 until the triangular sectioned ring 5.2 snaps past the inward facing triangular ring 3.1, creating a vacuum inside the plunger 3 and holding the piston 5 and the plunger 3 together as one piece. The vacuum is maintained by seals 4.1 and 5.1. The closure piece 4 is thus held at the end of the plunger 3.

Considering the capsule assembly 1, it is pre-charged with injectant fluid between the dished needle end 1.9 and the resilient plunger disc 1.8. Also, the assembly is fitted with the needle sheath 1.4 over the needle 1.2, which is held in place by the frangible sealant 1.3.

The capsule assembly 1 is passed through the interior of the barrel 2 until the needle mounting 1.1 rests in the nose 2.1 of the barrel. The aperture 2.1 is sufficiently large to allow the passage of the needle 1.2 and the protective, sealed sheath 1.4 through the aperture. The sheath 1.4 affords protection to the needle 1.2 and guidance in entering and locating the capsule assembly in the nose 2.1 of the barrel. The larger size of the nose aperture 2.1 in relation to the diameter of the needle 1.2 enables a bent needle to be retracted as will be evident hereinafter. The or each arm 2.2 abuts against the external lip 1.7 thereby restraining the capsule assembly 1 from inward movement. The seal afforded by the sheath 1.4 prevents inward movement of the plunger 3 being made before the sheath 1.4 has been removed from the needle 1.2.

residual injectant in the needle 1.2 is drawn into the resultant cavities thereby preventing any seepage of residual injectant from the needle 1.2.

Towards the end of the injection stroke, and before retraction has commenced, lip 3.4 snaps past wedge section ring 2.4 thus locking the plunger 3 with the barrel 2 and preventing the plunger from being withdrawn therefrom.

Figure 2 illustrates the resulting configuration of the syringe component shown in Figure 1, after needle retraction has occurred. It will be seen that the needle 1.2 has been withdrawn completely within the barrel 2 thereby obviating the risk of needle stick injury.

Figure 3 illustrates an alternative construction in which the energy used to effect retraction is provided by compression spring 6 rather than the vacuum between the plunger 3 and piston 5, of the embodiment of Figure 1. In the embodiment of Figure 3, the spring 6 is located within the plunger 3 and is of the maximum diameter allowed by the internal dimensions of the plunger 3. The triangular section ring 3.1 provides a stop which locates the spring 6. The probe 5.3 is passed through the interior of the spring 6 and inward pressure is applied to face 5.5, moving the piston 5 through the plunger 3 simultaneously compressing the spring 6 until the triangular sectioned ring 5.2 snaps past the triangular sectioned ring 3.1. The spring 6 is now held in compression and the plunger 3 and piston 5 are held together as one piece. The closure piece 4 is now fitted into the barrel and held by the wedge sectioned ring 3.2. Operation of the device is as previously described with reference to Figure 1, with the retraction of the needle being performed under the force of compression spring 6 rather than the vacuum as previously described.

Figure 4 illustrates a configuration in which the compression spring 6 is located within the barrel 2, so as to surround the capsule assembly 1. The capsule assembly 1 is passed through the interior of the spring 6 which is compressed against the locally increased diameter 1.5 as the capsule assembly 1 is loaded into place. The capsule assembly 1 is held in position and the spring 6 is held in compression by the or each arm 2.2. acting on the external lip 1.7. The piston 5 has a triangularly

immediately prior to use. Seepage and spillage of the injectant are prevented as previously described.

Thus, the syringe according to the invention is reliable, instinctive in its operation and capable of being used with one hand. Furthermore, the needle is automatically retracted completely following the injection and, because the aperture 2.1 in the nose of barrel is relatively large, it has the capacity to retract a bent needle. Furthermore, re-exposure of the needle cannot occur after the injection thereby minimising the risk of a needle stick injury. Also, accidental retraction of the needle before the injection is prevented.

The described examples of syringe according to the invention are so configured that there are locked closed after use to provide for compact and safe disposal. The described syringes can be manufactured at low cost.

11. A syringe as claimed in claims 7 and 9 in which the retractable part of the plunger couples to the capsule and needle assembly near completion of the injection stroke.

12. A syringe as claimed in any preceding claim in which the plunger is axially collapsible at a set overload.

13. A syringe as claimed in any preceding claim in which the needle and capsule assembly is retained prior to retraction by a catch displaceable by the plunger on completion of the injection stroke.

14. A syringe as claimed in claim 13 in which the said catch is an integrally formed feature of the housing.

15. A syringe as claimed in claim 13 in which the said catch is a separate component or assembly.

16. A syringe as claimed in any preceding claim in which the needle and capsule assembly can be installed through the main housing of the syringe.

17. A syringe as claimed in any preceding claim in which the needle end of the housing is provided with a non cylindrical aperture through which the needle and sheath can pass and into which a co-acting non cylindrical section of the capsule enters to allow a torque to be applied to the sheath to break the seal and facilitate its removal.

18. A syringe as claimed in claim 17 in which the clearance provided by the non cylindrical aperture in the housing allows he stored energy to retract and retain within the housing a bent needle.

19. A syringe as claimed in claims 1 to 16 in which the needle end of the housing is provided with a cylindrical aperture through which the needle and sheath can pass and into which a co-acting cylindrical section of the capsule enters, relative rotational movement being prevented by co-acting protuberance and receptor on

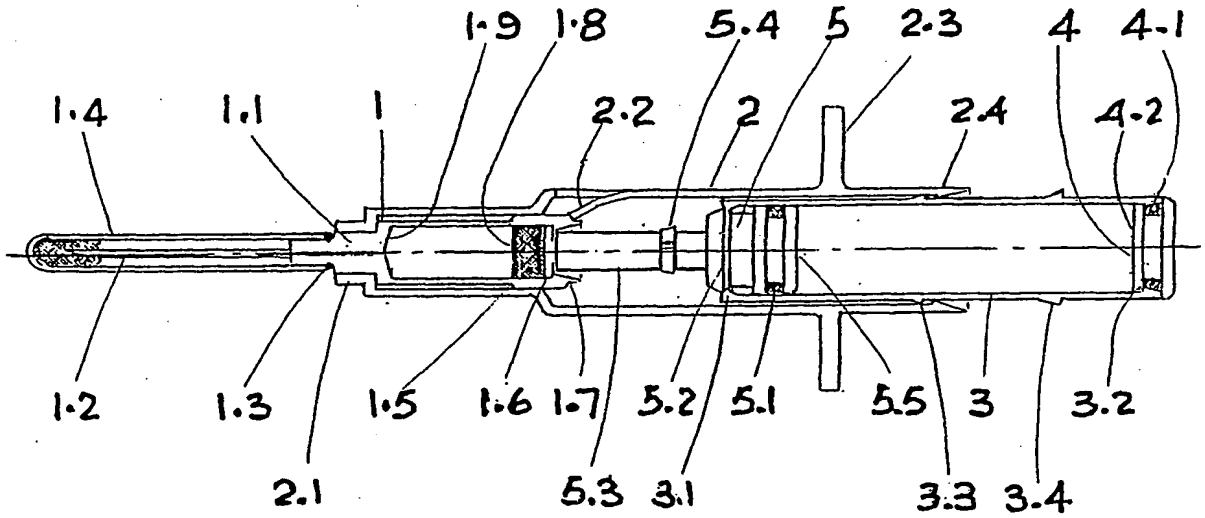

FIG 1

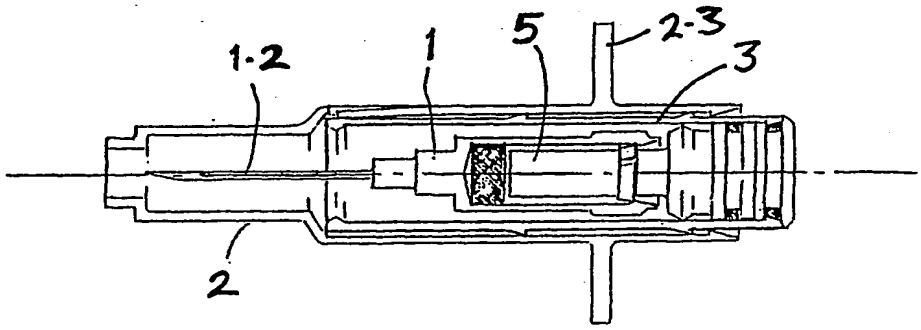

FIG 2

INTERNATIONAL SEARCH REPORT

ernational Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61M5/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y		4-6,14
Y	WO 94 07553 A (SENETEK PLC) 14 April 1994 (1994-04-14) page 19, line 5 - line 15	4-6
Y	US 5 779 677 A (FREZZA PIERRE) 14 July 1998 (1998-07-14) column 5, line 19 - line 30; figures 1-3	14
A	US 5 695 472 A (WYRICK RONALD E) 9 December 1997 (1997-12-09) figure 4	1

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA	Authorized officer
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Information on patent family members

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